Historic, Archive Document

Do not assume content reflects current
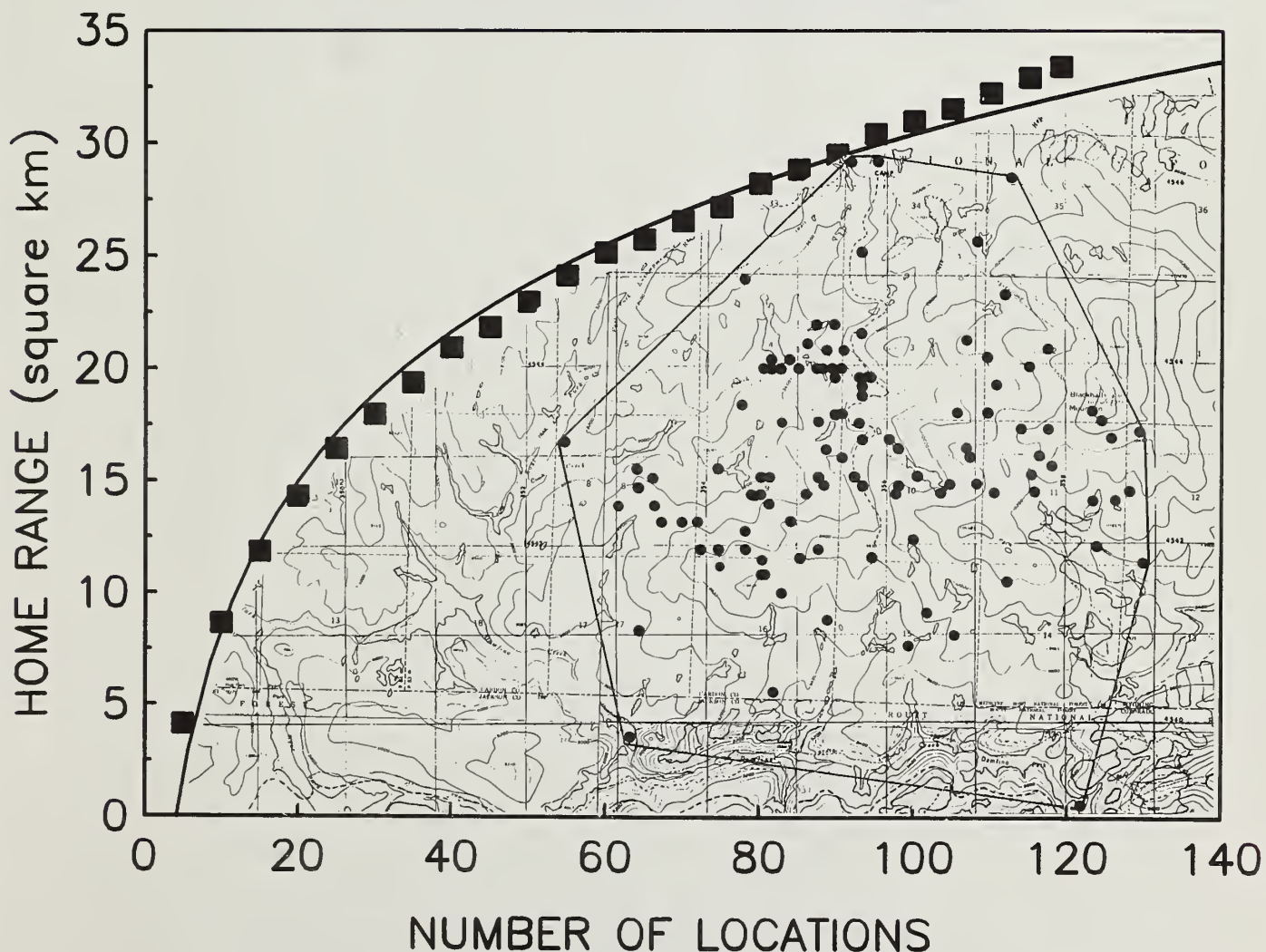scientific knowledge, policies, or practices.

Nat. Ag. Library

cat/ln/

Bootstrap Estimation of Home Range Area: User's Guide to Program HOMERANG

Martin G. Raphael and Glen E. Brink

Abstract

Program HOMERANG estimates the home range area of an in-
dividual animal and uses bootstrapping to assess the influence of
sample size. UTM coordinates of locations of sightings or captures
are the "X-Y Cartesian points" used in computing the area of the
largest polygon that will enclose all the locations. Sample runs are
included.

Bootstrap Estimation of Home Range Area: User's Guide to Program HOMERANG

Martin G. Raphael, Research Wildlife Biologist
and
Glen E. Brink, Computer Programmer Analyst
Rocky Mountain Forest and Range Experiment Station[1]

Acknowledgments

Bootstrap Estimation of Home Range Area: User's Guide to Program HOMERANG

Martin G. Raphael and Glen E. Brink

Program HOMERANG estimates the home range area of an individual animal and uses bootstrapping to assess the influence of sample size (Raphael, in prep.). Universal Transverse Mercator (UTM) coordinates of locations of sightings or captures are the "X-Y Cartesian points" used in computing the area of the largest polygon that will enclose all the locations. An index of home range size (Metzgar and Sheldon 1974) is also computed, using nonlinear regression to fit

$$Y = a * [1 - e^{**(-bX)}]$$

where

X = number of locations
Y = home range size
a = regression parameter and index of home range size
b = regression parameter.

The program is written in FORTRAN 77, compiled by the Microsoft FORTRAN compiler (4.01), and runs on IBM PC compatible equipment.[2] It requires 150,000 available bytes of memory and space on a disk or diskette for input/output files. An online printer for displaying the results is recommended. The version in the root directory on the diskette requires a math coprocessor; if one is not present, the message "Floating point routines not loaded" will appear when the program is executed. A version of the program that does not require a math coprocessor is in the subdirectory NO87 on the distribution diskette.

Input is in two forms:
1. Data file. This file contains an identification number for each animal, the date of the sighting or capture, and the UTM coordinates. The file must be in ascending order by identification number and date.
2. Keyboard instructions at execution time, which establish the desired options for the run. (These instructions may be saved on a disk file for use in subsequent runs, thus avoiding repetitive keyboarding.)

Output is in three forms:
1. Screen or console monitor. The instructions and interactions with the user during the establishment of the run options are displayed first. Because the program requires infrequent observable interaction with external devices, "I'm still working" messages appear on the screen during lengthy bootstrapping iterations. Finally, the iterations of the nonlinear regression to calculate the index of home range size are also displayed on the screen.
2. Printer. The results of the bootstrapping for all sample sizes (in selected increments) from 3 to the actual number of locations are printed, along with the standard error and the 95% confidence interval. A summary of the home range size index computations is then printed at the foot of the output; it shows the index, its 95% confidence interval, the regression coefficients, and the predicted number of locations that would be required to achieve 95% of the index.
3. Disk file. An exact copy of the bootstrapping output displayed on the printer, but without headings or the summary of home range size index information, is filed on the disk for use as input to other software such as graphics packages.

Executing the Program

The discussion below contains the interactions of an actual run, with the program's communication in upper case, and the user's instructions and responses in lower case. Comments for the purpose of this guide are enclosed in brackets [ ], and are neither displayed by the program nor entered by the user:

homerang [The user initiates a run with this command.]

ESTIMATE OF HOME RANGE AREA 06-15-88 10:24:10	[The program responds with the date and time and asks for the name of the input file.]
INPUT FILE NAME? marten-2.dat	[Both the input and output files names may contain path information and each is limited to 80 characters.]

OUTPUT FILE NAME?
marten-2.out

IS AN ONLINE PRINTER AVAILABLE? (Y = YES) > n   [It is recommended that an online printer be
                                                        used. If not, respond "N" and the next prompt
NAME OF FILE TO RECEIVE "PRINTED" OUTOUT?   will request disk space.]
marten-2.prn

THE FOLLOWING DEFAULTS ARE IN EFFECT:

[The program displays the default options. If the defaults are acceptable, the user merely presses the enter key
when asked. If revised defaults from an earlier run were saved on a disk file, that file may be read by typing
"R" and responding to the prompts; the revised defaults will then be displayed and the user could introduce
still further modifications. The example below changes all 9 options from the original set, but only for illustra-
tion. All options may be reset as many times as necessary to configure the desired run.]

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 10
2) INITIAL SAMPLE SIZE TO DRAW: 3
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 1
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 1000
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 1794 26680
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL 11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44   (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 1   [The 1 is the user's response.]

[If the user's data file contains many animals, or if the run is to be done by date (line 4), it is possible that there
will be insufficient sightings to perform an area computation. Obviously, the minimum number of points re-
quired is 3, but the user may wish to limit the run to a more significant number of locations from which to
draw the bootstrap samples. This does not limit the maximum number of points that will be considered for
an animal; it merely excludes animals or dates that have an insufficient or an insignicant number of locations.
In this case, the user responds below with "8", meaning that any animal (or date, if the run is being done
by date) with fewer than eight locations would eliminated.]

ENTER THE MINIMUM NUMBER OF LOCATIONS FOR INCLUSION,
   3 <= MINIMUM <= 500 > 8

[The program now displays again the entire set of options, including the revised number of locations. If necessary,
line 1 could be changed again. The bold face in the display below is only for the purpose of this guide and
is not part of the program.]

1) **MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8**
2) INITIAL SAMPLE SIZE TO DRAW: 3
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 1
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 1000
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 1794 26680
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL 11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44   (DIGITS AFTER IMPLIED DECIMAL: 1)

7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 2   [The 2 is the user's response.]

[The program will randomly draw samples of size 3, 4, 5, . . . N, from the set of N locations and compute the area for each sample. If N is large, the time required to complete the run may be prohibitive. The time for the run could be reduced by specifying either a larger initial sample size or a larger increment between sample sizes. Note that any reduction diminishes the number of points available to the regression and that the final sample size, which includes all N locations, is always calculated regardless of the pattern established by the increment.]

ENTER THE INITIAL SAMPLE SIZE TO DRAW > 20   [The 20 and the 2
ENTER THE INCREMENT OF SAMPLE SIZE BETWEEN DRAWS >2   are the user's responses.]
   [The program redisplays the options.]

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) **INITIAL SAMPLE SIZE TO DRAW: 20**
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 1000
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 1794 26680
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL 11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33 (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44 (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 3   [The 3 is the user's response.]

[Bootstrapping requires that M samples be drawn for each sample size, and the mean of the M areas thus computed is the computed home range area. As M grows larger, the time required for a run will increase. The user can alter M by entering a 3 as shown above. In this example, the number of bootstrap iterations or the number of samples to be drawn is set to 200. Note that a larger M will result in a smaller standard error.]

ENTER THE NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN > 200
   [The program redisplays the options.]

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) INITIAL SAMPLE SIZE TO DRAW: 20
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) **NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 200**
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 1794 26680
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL 11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33 (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44 (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 4   [The 4 is the user's response.]

[If the run is to perform the analysis by date, the user enters either "Y" or "y" without the quotes. When this option is selected, the data must be in order by date. The data can then be processed by time periods for each animal. The user may group the months into a minimum of 1 time period and a maximum of 12 time periods. As the user is prompted for the time period for each month, the period number is entered.]

IS THE ESTIMATE TO BE COMPUTED BY DATE? (Y = YES) > y   [The user's data is ordered by
PLEASE ENTER PERIOD FOR JAN (1-12)   > 1   date and is to be processed
PLEASE ENTER PERIOD FOR FEB (1-12)   > 1   in 2 "seasons".]
PLEASE ENTER PERIOD FOR MAR (1-12)   > 1
PLEASE ENTER PERIOD FOR APR (1-12)   > 2
PLEASE ENTER PERIOD FOR MAY (1-12)   > 2
PLEASE ENTER PERIOD FOR JUN (1-12)   > 2
PLEASE ENTER PERIOD FOR JUL (1-12)   > 2
PLEASE ENTER PERIOD FOR AUG (1-12)   > 2
PLEASE ENTER PERIOD FOR SEP (1-12)   > 2
PLEASE ENTER PERIOD FOR OCT (1-12)   > 1
PLEASE ENTER PERIOD FOR NOV (1-12)   > 1
PLEASE ENTER PERIOD FOR DEC (1-12)   > 1
       [The program redisplays the options.]

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) INITIAL SAMPLE SIZE TO DRAW: 20
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 200
4) ESTIMATE COMPUTED BY DATE: YES
   PERIOD/MONTH: 1/JAN 1/MAR 2/MAY 2/JUL 2/SEP 1/NOV
                    1/FEB 2/APR 2/JUN 2/AUG 1/OCT 1/DEC
5) RANDOM NUMBER GENERATOR SEEDS: 1794 26680
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44   (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 5   [The 5 is the user's response.]

[The program utilizes a good pseudo-random number generator (Thesen 1985) for the randomizing of the draws in bootstrapping. It requires two seeds, both of which must be integers between 1 and 32767 inclusive. The term "pseudo" is applied because if the same two seeds are used in successive runs, the same sequence of "random numbers" will be generated. The default seeds are a function of the date and time of the run, thus attempting to introduce some randomness even into starting of the generator. If, however, it is desired to replicate a previous run precisely, the user may enter the random number seeds that were used in that run.]

ENTER TWO RANDOM NUMBER GENERATOR SEEDS BETWEEN 1 AND 32767 INCLUSIVE
   (SPACE BETWEEN THEM) > 17 19
       [The program redisplays the options.]

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) INITIAL SAMPLE SIZE TO DRAW: 20
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 200
4) ESTIMATE COMPUTED BY DATE: YES
   PERIOD/MONTH: 1/JAN 1/MAR 2/MAY 2/JUL 2/SEP 1/NOV
                  1/FEB 2/APR 2/JUN 2/AUG 1/OCT 1/DEC

5) RANDOM NUMBER GENERATOR SEEDS: 17 19
6) INPUT FORMAT:
ANIMAL ID NUMBER	COL	11- 12
MONTH		15- 16
DAY		18- 19
YEAR		21- 22
UTM NORTH COORDINATE		28- 33 (DIGITS AFTER IMPLIED DECIMAL: 1)
UTM EAST COORDINATE		40- 44 (DIGITS AFTER IMPLIED DECIMAL: 1)

7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 6   [The 6 is the user's response.]

[If the user's input file named at the beginning of the interaction with the program is not in the default format, the user must specify the new format. The program will ask for the column numbers of each of the fields; the fields do not have to be in the same order as requested, as shown below when the user's date format is YY/MM/DD. The field width of the ID number, month, day, and year may not exceed 2 digits; for the UTM coordinates, the maximum field width is 9, including the decimal if it is explicitly entered into the data file.]

INPUT FORMAT: ENTER THE BEGINNING AND ENDING COLUMN NUMBERS (SPACE BETWEEN THEM).
   ANIMAL ID NUMBER? > 1 2
   MONTH? > 5 6
   DAY? > 7 8
   YEAR? > 3 4
   UTM N? > 11 15
NUMBER OF DIGITS RIGHT OF IMPLIED DECIMAL POINT?
(IF THE DECIMAL IS ALREADY ENTERED IN EACH VALUE OR IF THERE IS NO NEED FOR AN IMPLIED DECIMAL, ENTER 0) > 1
   UTM E? > 16 20
NUMBER OF DIGITS RIGHT OF IMPLIED DECIMAL POINT?
(IF THE DECIMAL IS ALREADY ENTERED IN EACH VALUE OR IF THERE IS NO NEED FOR AN IMPLIED DECIMAL, ENTER 0) > 1
   [The program redisplays the options.]

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) INITIAL SAMPLE SIZE TO DRAW: 20
    INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 200
4) ESTIMATE COMPUTED BY DATE: YES
    PERIOD/MONTH: 1/JAN 1/MAR 2/MAY 2/JUL 2/SEP 1/NOV
                    1/FEB 2/APR 2/JUN 2/AUG 1/OCT 1/DEC
5) RANDOM NUMBER GENERATOR SEEDS: 17 19
6) INPUT FORMAT:
ANIMAL ID NUMBER	COL	1- 2
MONTH		5- 6
DAY		7- 8
YEAR		3- 4
UTM NORTH COORDINATE		11- 15 (DIGITS AFTER IMPLIED DECIMAL: 1)
UTM EAST COORDINATE		16- 20 (DIGITS AFTER IMPLIED DECIMAL: 1)

7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 7   [The 7 is the user's response.]

[The default "critical value" used in the computations between the standard error and the confidence interval is 2.0, but may be adjusted for different alpha levels or multiple regression comparisons. The value should depend on degrees of freedom, which depends on the size of the data set. The usual formula is $df = (n - p - 1)$ where n is the sample size (number of locations), and p is the number of regression parameters (2).]

5

ENTER "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.576
   [The program redisplays the options.]
1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) INITIAL SAMPLE SIZE TO DRAW: 20
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 200
4) ESTIMATE COMPUTED BY DATE: YES
   PERIOD/MONTH: 1/JAN 1/MAR 2/MAY 2/JUL 2/SEP 1/NOV
                1/FEB 2/APR 2/JUN 2/AUG 1/OCT 1/DEC
5) RANDOM NUMBER GENERATOR SEEDS: 17 19
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   1- 2
   MONTH   5- 6
   DAY   7- 8
   YEAR   3- 4
   UTM NORTH COORDINATE   11- 15   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   16- 20   (DIGITS AFTER IMPLIED DECIMAL: 1)
7) **"CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.6**
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 8   [The 8 is the user's response.]

   [The regression usually is terminated after 100 attempts at convergence; the user may expand the number of
    attempts if it appears that success may be achieved by doing so. The computational time increase for 150 itera-
    tions, for example, would be minimal.]

ENTER MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 150
   [The program redisplays the options.]
1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) INITIAL SAMPLE SIZE TO DRAW: 20
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 200
4) ESTIMATE COMPUTED BY DATE: YES
   PERIOD/MONTH: 1/JAN 1/MAR 2/MAY 2/JUL 2/SEP 1/NOV
                1/FEB 2/APR 2/JUN 2/AUG 1/OCT 1/DEC
5) RANDOM NUMBER GENERATOR SEEDS: 17 19
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   1- 2
   MONTH   5- 6
   DAY   7- 8
   YEAR   3- 4
   UTM NORTH COORDINATE   11- 15   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   16- 20   (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.6
8) **MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 150**
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 9   [The 9 is the user's response.]

   [Occasionally, the regression's default initial parameters are such poor estimates that convergence cannot be
    achieved. The user may opt to specify initial estimates, as illustrated below. These estimates may be taken
    from values listed at the end of a previous run.]

START REGRESSION WITH USER SPECIFIED VALUES? (Y = YES): y
ENTER SPECIFIED VALUE FOR PARAMETER 1: 11.
ENTER SPECIFIED VALUE FOR PARAMETER 2: .055
   [The program redisplays the options.]
1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 8
2) INITIAL SAMPLE SIZE TO DRAW: 20
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2

3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 200
4) ESTIMATE COMPUTED BY DATE: YES
   PERIOD/MONTH: 1/JAN 1/MAR 2/MAY 2/JUL 2/SEP 1/NOV
                 1/FEB 2/APR 2/JUN 2/AUG 1/OCT 1/DEC
5) RANDOM NUMBER GENERATOR SEEDS: 17 19
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   1- 2
   MONTH   5- 6
   DAY   7- 8
   YEAR   3- 4
   UTM NORTH COORDINATE   11- 15 (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   16- 20 (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.6
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 150
9) **START REGRESSION WITH USER SPECIFIED VALUES? Y**
       SPECIFIED VALUE, PARAMETER 1:   11.0000
       SPECIFIED VALUE, PARAMETER 2:   .550000E-01
TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER >

[When the options are configured as desired, the user responds to the above prompt with nothing more than
an ENTER or carriage return. It should be noted that any response other than 1 through 9, an R, a space (which
is interpreted as an Enter in this case), or an Enter is considered an invalid response and the options are
redisplayed. The user is then given the opportunity to save the revised defaults on a file for use in subsequent
runs.]

DO YOU WANT TO SAVE THE ABOVE DEFAULTS ON A FILE FOR POSSIBLE USE ON ANOTHER RUN?
(Y = YES) > y
SAVED DEFAULTS FILE NAME?   marten-2.sav

[The defaults are saved on the specified disk file and the program begins execution. At any point in the parameter
specification or in the run itself, the user may interrupt with a Ctrl Break and before the next message appears
on the screen, the run will be terminated; however, the information already written to the disk file will be
lost to normal use or viewing and a DIR will show the file to be 0 bytes in length. The DOS command CHKDSK
/F must be run to clear the disk of the lost chain generated by the interrupt or its space will never be available
again to DOS, even after issuing the command ERASE filename.ext.]

Sample Input File

2	9/26/85	4545.8	353.1									
2	9/30/85	4543.2	353.6									
2	10/10/85	4544.8	355.8									
2	10/14/85	4544.8	355.3	2	12/06/85	4545.1	353.7					
2	10/21/85	4544.5	354.2	2	12/11/85	4544.2	353.8					
2	10/28/85	4544.4	353.3	2	12/21/85	4543.9	353.8					
2	11/01/85	4545.6	354.0	2	12/25/85	4543.6	352.5					
2	11/04/85	4542.9	354.4	2	12/29/85	4544.1	353.6					
2	11/12/85	4544.1	354.6	2	1/03/86	4543.6	356.3	2	3/17/86	4543.5	355.7
2	11/15/85	4544.3	353.6	2	1/07/86	4541.5	355.6	2	3/21/86	4544.7	354.5
2	11/22/85	4544.8	353.1	2	1/10/86	4543.2	355.3	2	3/24/86	4544.7	353.8
2	11/26/85	4543.2	355.3	2	1/12/86	4542.8	354.3	2	3/30/86	4543.6	355.4
2	12/03/85	4541.9	355.2	2	2/07/86	4544.0	355.1	2	4/02/86	4545.1	356.0
				2	2/21/86	4543.4	355.5	2	4/05/86	4545.0	356.0
				2	2/28/86	4544.8	356.3	2	4/07/86	4544.7	355.3
				2	3/07/86	4545.2	353.0	2	4/14/86	4544.9	355.8
				2	3/10/86	4545.1	353.7	2	4/19/86	4545.2	355.5
				2	3/16/86	4543.8	354.6	2	4/22/86	4544.8	355.7
								2	4/22/86	4544.6	356.2
								2	4/25/86	4544.3	355.7
								2	4/29/86	4544.6	355.7
								2	5/02/86	4544.3	355.3
								2	5/08/86	4544.3	355.7

ESTIMATE OF HOME RANGE AREA 06-20-88 16:24:43

INPUT FILE NAME? 0 OUTPUT FILE NAME? 0 IS AN ONLINE PRINTER AVAILABLE? (Y = YES) > y
THE FOLLOWING DEFAULTS ARE IN EFFECT:

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 10
2) INITIAL SAMPLE SIZE TO DRAW: 3
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 1
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 1000
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 2304 20640
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44   (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER   > 2
ENTER THE INITIAL SAMPLE SIZE TO DRAW > 3
ENTER THE INCREMENT OF SAMPLE SIZE BETWEEN DRAWS > 2

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 10
2) INITIAL SAMPLE SIZE TO DRAW: 3
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 1000
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 2304 20640
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44   (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES? N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 3
ENTER THE NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN > 20

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 10
2) INITIAL SAMPLE SIZE TO DRAW: 3
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 20
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 2304 20640
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44   (DIGITS AFTER IMPLIED DECIMAL: 1)

7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES?   N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER > 5
ENTER TWO RANDOM NUMBER GENERATOR SEEDS BETWEEN 1 AND 32767 INCLUSIVE
    (SPACE BETWEEN THEM) > 77 1638

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 10
2) INITIAL SAMPLE SIZE TO DRAW: 3
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 20
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 77 1638
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL   11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33   (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44   (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES?   N

TO CHANGE ANY OF THE ABOVE, TYPE THE LINE NUMBER AND PRESS ENTER.
TO READ DEFAULTS SAVED FROM AN EARLIER RUN, TYPE R AND PRESS ENTER.
IF ALL ARE ACCEPTABLE, PRESS ENTER >
DO YOU WANT TO SAVE THE ABOVE DEFAULTS ON A FILE FOR POSSIBLE USE ON ANOTHER RUN?
(Y = YES)   > n

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF   3 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:45

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF   5 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:46

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF   7 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:46

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF   9 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:47

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 11 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:48

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 13 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:50

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 15 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:51

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 17 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:53

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 19 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:55

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 21 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:24:58

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 23 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:25:00

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 25 FOR ID 2, 9/26/85 – 5/ 8/86
                    06-20-88 16:25:03

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 27 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:06

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 29 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:09

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 31 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:13

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 33 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:17

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 35 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:21

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 37 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:25

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 39 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:29

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 41 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:34

FROM 43 POINTS, DRAWING A SAMPLE SIZE OF 43 FOR ID 2, 9/26/85 – 5/ 8/86
06-20-88 16:25:39

NONLINEAR REGRESSION

ITERATION	RES SUM SQ	P(1)	P(2) . . .
0	4.4722	10.4449	.0629
1	3.8040	10.5114	.0631
2	3.0957	10.6056	.0633
3	2.6331	10.7083	.0635
4	2.4698	10.7864	.0634
5	2.4030	10.8332	.0628
6	2.3458	10.8807	.0617
7	2.3103	10.9578	.0602
8	2.2774	11.0695	.0585
9	2.1782	11.1899	.0576
10	2.1271	11.2593	.0576
11	2.1333	11.2580	.0573
12	2.1291	11.2571	.0574
13	2.1275	11.2565	.0575
14	2.1271	11.2562	.0575
15	2.1270	11.2609	.0575
16	2.1273	11.2642	.0576
17	2.1270	11.2644	.0576
18	2.1269	11.2645	.0575
19	2.1270	11.2624	.0575
20	2.1269	11.2623	.0575
21	2.1273	11.2636	.0576
22	2.1271	11.2638	.0576
23	2.1269	11.2639	.0575
24	2.1269	11.2640	.0575
25	2.1269	11.2627	.0575
26	2.1269	11.2626	.0575
27	2.1270	11.2633	.0576
28	2.1269	11.2634	.0575
29	2.1269	11.2635	.0575
30	2.1269	11.2635	.0575
31	2.1269	11.2628	.0575
32	2.1269	11.2628	.0575
33	2.1269	11.2631	.0575
34	2.1269	11.2632	.0575
35	2.1269	11.2632	.0575
36	2.1269	11.2633	.0575
37	2.1269	11.2629	.0575

NORMAL TERMINATION.
Stop – Program terminated.

ESTIMATE OF HOME RANGE AREA 06-20-88 16:24:43

INPUT FILE:
marten-2.dat

OUTPUT FILE:
marten-2.out

1) MINIMUM SAMPLE SIZE (NUMBER OF LOCATIONS) FOR INCLUSION: 10
2) INITIAL SAMPLE SIZE TO DRAW: 3
   INCREMENT OF SAMPLE SIZE BETWEEN DRAWS: 2
3) NUMBER OF BOOTSTRAP SAMPLES TO BE DRAWN: 20
4) ESTIMATE COMPUTED BY DATE: NO
5) RANDOM NUMBER GENERATOR SEEDS: 77 1638
6) INPUT FORMAT:
   ANIMAL ID NUMBER   COL 11- 12
   MONTH   15- 16
   DAY   18- 19
   YEAR   21- 22
   UTM NORTH COORDINATE   28- 33 (DIGITS AFTER IMPLIED DECIMAL: 1)
   UTM EAST COORDINATE   40- 44 (DIGITS AFTER IMPLIED DECIMAL: 1)
7) "CRITICAL VALUE" FOR COMPUTING CONFIDENCE INTERVAL: 2.0
8) MAXIMUM NUMBER OF REGRESSION ITERATIONS FOR CONVERGENCE: 100
9) START REGRESSION WITH USER SPECIFIED VALUES?

ESTIMATION OF HOME RANGE AREA WITH BOOTSTRAPPING 06-20-88 16:24:43

INPUT FILE:
marten-2.dat

OUTPUT FILE:
marten-2.out

ID	FROM – TO	NO. POINTS TOT	SAM	HOME RANGE AREA ESTIMATE	STD ERR	95% CONF. INT. X = NORMAL, Y = PERCENTILE (SEE NOTE BELOW)	
2	9/26/85 – 5/ 8/86	43	3	.87	.98	−1.09 <= X <= .05 <= Y <=	2.83 2.48
2	9/26/85 – 5/ 8/86	43	5	2.09	1.00	.10 <= X <= .68 <= Y <=	4.09 3.56
2	9/26/85 – 5/ 8/86	43	7	3.73	1.36	1.02 <= X <= 1.86 <= Y <=	6.45 5.46
2	9/26/85 – 5/ 8/86	43	9	4.81	1.59	1.62 <= X <= 2.62 <= Y <=	7.99 6.88
2	9/26/85 – 5/ 8/86	43	11	5.21	1.30	2.61 <= X <= 2.85 <= Y <=	7.82 7.33
2	9/26/85 – 5/ 8/86	43	13	6.02	1.78	2.46 <= X <= 3.47 <= Y <=	9.58 8.19
2	9/26/85 – 5/ 8/86	43	15	6.97	1.10	4.77 <= X <= 5.40 <= Y <=	9.17 8.47
2	9/26/85 – 5/ 8/86	43	17	6.92	1.11	4.70 <= X <= 4.50 <= Y <=	9.13 8.23
2	9/26/85 – 5/ 8/86	43	19	7.66	1.13	5.39 <= X <= 5.97 <= Y <=	9.92 9.56
2	9/26/85 – 5/ 8/86	43	21	7.91	1.40	5.10 <= X <= 5.62 <= Y <=	10.71 9.91

11

2	9/26/85 – 5/ 8/86	43	23	8.50	1.44	5.61 <= X <=	11.38
						5.92 <= Y <=	10.44
2	9/26/85 – 5/ 8/86	43	25	8.61	1.22	6.17 <= X <=	11.06
						6.25 <= Y <=	10.02
2	9/26/85 – 5/ 8/86	43	27	8.90	1.15	6.60 <= X <=	11.20
						6.36 <= Y <=	10.34
2	9/26/85 – 5/ 8/86	43	29	9.31	.83	7.65 <= X <=	10.97
						7.52 <= Y <=	10.23
2	9/26/85 – 5/ 8/86	43	31	9.56	1.04	7.49 <= X <=	11.63
						7.33 <= Y <=	10.44
2	9/26/85 – 5/ 8/86	43	33	9.21	1.10	7.01 <= X <=	11.40
						7.00 <= Y <=	10.44
2	9/26/85 – 5/ 8/86	43	35	9.63	1.02	7.58 <= X <=	11.68
						7.56 <= Y <=	10.44
2	9/26/85 – 5/ 8/86	43	37	9.56	.90	7.75 <= X <=	11.36
						7.71 <= Y <=	10.44
2	9/26/85 – 5/ 8/86	43	39	10.17	.49	9.19 <= X <=	11.15
						8.88 <= Y <=	10.44
2	9/26/85 – 5/ 8/86	43	41	10.11	.67	8.77 <= X <=	11.44
						8.26 <= Y <=	10.44
2	9/26/85 – 5/ 8/86	43	43	10.44	.00	10.44 <= X <=	10.44
						10.44 <= Y <=	10.44
HOME RANGE SIZE INDEX				11.26	.31	10.64 <= X <=	11.89

REGRESSION COEFFICIENTS:
  A = 11.2629
  B =   .0575

        AT 95% OF INDEX, SAMPLE SIZE = 52.1
                   HOME RANGE AREA = 10.70

NOTE: CONFIDENCE INTERVALS BASED ON
        X) NORMAL DISTRIBUTION USING "CRITICAL VALUE"
        Y) PERCENTILE METHOD WHICH EXCLUDES THE LOWER 2.5% AND UPPER 2.5% OF THE
           ESTIMATED AREAS COMPUTED ABOVE

NORMAL TERMINATION. 06-20-88 16:25:41

Sample Run: Disk File

(Note: Excess blanks deleted to facilitate documentation display.)

2	9/26/85 – 5/ 8/86	43	3	.87	.98	−1.09	2.83	.05	2.48
2	9/26/85 – 5/ 8/86	43	5	2.09	1.00	.10	4.09	.68	3.56
2	9/26/85 – 5/ 8/86	43	7	3.73	1.36	1.02	6.45	1.86	5.46
2	9/26/85 – 5/ 8/86	43	9	4.81	1.59	1.62	7.99	2.62	6.88
2	9/26/85 – 5/ 8/86	43	11	5.21	1.30	2.61	7.82	2.85	7.33
2	9/26/85 – 5/ 8/86	43	13	6.02	1.78	2.46	9.58	3.47	8.19
2	9/26/85 – 5/ 8/86	43	15	6.97	1.10	4.77	9.17	5.40	8.47
2	9/26/85 – 5/ 8/86	43	17	6.92	1.11	4.70	9.13	4.50	8.23
2	9/26/85 – 5/ 8/86	43	19	7.66	1.13	5.39	9.92	5.97	9.56
2	9/26/85 – 5/ 8/86	43	21	7.91	1.40	5.10	10.71	5.62	9.91
2	9/26/85 – 5/ 8/86	43	23	8.50	1.44	5.61	11.38	5.92	10.44
2	9/26/85 – 5/ 8/86	43	25	8.61	1.22	6.17	11.06	6.25	10.02
2	9/26/85 – 5/ 8/86	43	27	8.90	1.15	6.60	11.20	6.36	10.34
2	9/26/85 – 5/ 8/86	43	29	9.31	.83	7.65	10.97	7.52	10.23

2	9/26/85 – 5/ 8/86	43	31	9.56	1.04	7.49	11.63	7.33	10.44
2	9/26/85 – 5/ 8/86	43	33	9.21	1.10	7.01	11.40	7.00	10.44
2	9/26/85 – 5/ 8/86	43	35	9.63	1.02	7.58	11.68	7.56	10.44
2	9/26/85 – 5/ 8/86	43	37	9.56	.90	7.75	11.36	7.71	10.44
2	9/26/85 – 5/ 8/86	43	39	10.17	.49	9.19	11.15	8.88	10.44
2	9/26/85 – 5/ 8/86	43	41	10.11	.67	8.77	11.44	8.26	10.44
2	9/26/85 – 5/ 8/86	43	43	10.44	.00	10.44	10.44	10.44	10.44

Example of Nonconvergence Printout

ESTIMATION OF HOME RANGE AREA WITH BOOTSTRAPPING 01-26-88 12:57:35

INPUT FILE: noconvrg.dat
OUTPUT FILE: noconvrg.out

		NO. POINTS		HOME RANGE AREA		95% CONF. INT. X = NORMAL, Y = PERCENTILE	
ID	FROM – TO	TOT	SAM	ESTIMATE	STD ERR	(SEE NOTE BELOW)	
2	9/26/85 – 11/15/85	10	3	.72	.81	−.90 <= X <=	2.34
						.03 <= Y <=	2.27
2	9/26/85 – 11/15/85	10	4	1.25	.66	−.07 <= X <=	2.56
						.15 <= Y <=	2.14
2	9/26/85 – 11/15/85	10	5	2.20	.73	.73 <= X <=	3.67
						1.01 <= Y <=	3.35
2	9/26/85 – 11/15/85	10	6	2.66	.82	1.02 <= X <=	4.30
						1.29 <= Y <=	3.88
2	9/26/85 – 11/15/85	10	7	3.10	.69	1.72 <= X <=	4.48
						1.66 <= Y <=	3.82
2	9/26/85 – 11/15/85	10	8	3.84	.66	2.51 <= X <=	5.17
						2.63 <= Y <=	4.50
2	9/26/85 – 11/15/85	10	9	4.07	.40	3.27 <= X <=	4.88
						3.53 <= Y <=	4.50
2	9/26/85 – 11/15/85	10	10	4.50	.00	4.50 <= X <=	4.50
						4.50 <= Y <=	4.50
HOME RANGE SIZE INDEX				8.33	9.06	−9.80 <= X <=	26.46

REGRESSION COEFFICIENTS:
    A = 8.3314
    B = .0651

        AT 95% OF INDEX, SAMPLE SIZE   = 46.0
                      HOME RANGE AREA =   7.91

NOTE: CONFIDENCE INTERVALS BASED ON
      X) NORMAL DISTRIBUTION USING "CRITICAL VALUE"
      Y) PERCENTILE METHOD, WHICH EXCLUDES THE LOWER 2.5% AND UPPER 2.5% OF THE
         ESTIMATED AREAS COMPUTED ABOVE

        *
        *   *
        *   FAILURE TO CONVERGE AFTER 20 ITERATIONS. RESULTS ARE SUSPECT.   *
        *   *
        *

NORMAL TERMINATION. 01–26–88   12:58:48

References

Metzgar, L. H.; Sheldon, A. L. 1974. An index of home
    range size. Journal of Wildlife Management 38:
    547–551.
Raphael, Martin G. A bootstrap technique for compar-
    ing homerange areas. (In preparation)
Thesen, Arne. 1985. An efficient generator of uniform-
    ly distributed random variates between zero and one.
    Simulation 44: 1, 17–22.

Rocky Mountains

Southwest

Great Plains

U.S. Department of Agriculture
Forest Service

Rocky Mountain Forest and Range Experiment Station

The Rocky Mountain Station is one of eight regional experiment stations, plus the Forest Products Laboratory and the Washington Office Staff, that make up the Forest Service research organization.

RESEARCH FOCUS

Research programs at the Rocky Mountain Station are coordinated with area universities and with other institutions. Many studies are conducted on a cooperative basis to accelerate solutions to problems involving range, water, wildlife and fish habitat, human and community development, timber, recreation, protection, and multiresource evaluation.

RESEARCH LOCATIONS

Research Work Units of the Rocky Mountain Station are operated in cooperation with universities in the following cities:

Albuquerque, New Mexico
Flagstaff, Arizona
Fort Collins, Colorado*
Laramie, Wyoming
Lincoln, Nebraska
Rapid City, South Dakota
Tempe, Arizona

*Station Headquarters: 240 W. Prospect St., Fort Collins, CO 80526